UNIVERSITÉ DE SHERBROOKE

Stratégies d'enseignements dans un laboratoire de soins infirmiers

Teaching Strategies in a Nursing Laboratory Setting

Par

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Essai présenté à la Faculté d'éducation

en vue de l'obtention du grade de

Maître en enseignement (M.Éd.)

Maîtrise en enseignement au collégial

avril, 2011

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SUMMARY

Due to the rapidly changing state of health care and the increasingly complexity of patient care, the role of nurses and the demands placed upon them have changed. This has also resulted in the expectation for novice nurses to practice the profession at a higher level of competence. As being able to competently practice this profession means that the nurse must be able to recall and apply theoretical knowledge to decide upon the appropriate intervention or action for their patient's care, the employers' expectation of these newly graduated nurses is that they be able to critically think independently upon their entry into the profession.

Within various nursing faculties and throughout the literature, a long noted problem has been nursing students' difficulty with integrating and transferring theoretical knowledge and learned skills to their respective clinical areas. These are key components in an individual's ability to think critically. The environments where concepts and skills are learned are different from the areas where the nursing students are expected to practice them, resulting in students being unable to identify, apply and/or adapt the appropriate skill or concept when variations are introduced into situations. Despite the need for change, the majority of nursing education continues to use traditional methods of teaching. Much of the literature with respect to this advocates for a change, but few studies have been done with nursing students until recently and none have been done with Cegep nursing students who are unique to Quebec.

The purpose of this study was to explore students' retention, comprehension and application of concepts when different teaching strategies were used to teach the same topic. The study's hypotheses were (1) students who receive knowledge about a specific nursing concept and practice, such as medical asepsis which are the practices

used to limit the number, growth and transmission of microorganisms to a specific area (Kozier, 2004, p. 744) , through a Problem Based Learning (PBL) approach would perform as well on tests of knowledge recall immediately post intervention as students who learned the same concept and practice by a procedural approach; (2) "PBL" students would perform better on future tests of knowledge recall; and (3) "PBL" students would apply their knowledge better during their clinical experience than the "procedural" students. To that end, a comparative study on two different approaches to teaching a skill within a laboratory setting was conducted. Using the concept of medical asepsis, a quasi-experimental research was designed to study the retention, comprehension and application of a concept over a sixteen-week semester in the fall of 2009. A convenience sample of fifteen first-semester nursing students enrolled in a six semester nursing programme in an English college in Montreal, Quebec was used. The control group, consisting of seven participants, were taught medical asepsis during the first lab session of the semester by a procedural or rote approach (the traditional method) and the experimental group, containing the remaining eight students, were taught the same concept by a Problem-Based Learning or PBL approach (non-traditional method). Three achievement tests administered at weeks one, five and seventeen of the semester collected data on the recall and retention of the concept. Participants' performance of isolation techniques based on the concept of medical asepsis during their seven-week clinical experience (weeks ten to sixteen) was directly observed by their clinical teacher, one of whom was the researcher, and was measured by a performance checklist.

In short, Hypothesis 1 was not supported, but Hypotheses 2 and 3 were. There was a marked difference between the scores of the control group and the experimental group on the first two achievement tests with the control group scoring higher. It was noteworthy to mention that although the experimental group still scored lower than the control group on the second achievement test, there was an overall improvement in their score when compared to the first test. With respects to the third and final achievement test, the results demonstrated that a PBL approach

leads to better long term recall and retention of a concept. Regarding application of a concept, the results were twofold. It was found that the teaching approach used had no effect upon a student's ability to perform a skill. However, the use of a PBL approach achieved a more consistent and independent use of a concept by students in real-life situations that differed from the one that the concept was originally taught or learned in. An incidental finding of this study was in relation to prior experience. It was demonstrated that prior real-world experience within the associated field facilitated a student's ability to understand, integrate and apply theory. Although the sample size was small, the results were promising and emphasize the need for further research in this area.

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Étant donné le changement rapide du système des soins de santé et la complexité croissante des soins aux patients, le rôle des infirmières et les exigences qui leur sont attribuées ont bien changé. Conséquemment, on s'attend des infirmières débutantes qu'elles exercent leur profession à un niveau plus élevé de compétences. L'exercice compétent de cette profession implique que les infirmières peuvent faire appel à et mettre en pratique leurs connaissances théoriques pour choisir l'intervention appropriée ou l'action nécessaire aux soins de leur patient. Les employeurs s'attendent à ce que ces infirmières nouvellement diplômées puissent penser de façon critique et autonome dès leur entrée dans la profession.

Une problématique souvent mentionnée dans de nombreuses facultés des sciences infirmières et dans toute la littérature, est celui de la difficulté qu'éprouvent les étudiants en soins infirmiers à intégrer et à transférer leurs connaissances théoriques et leurs compétences apprises dans leurs domaines cliniques respectifs. Ces habilités sont des éléments essentiels à la capacité de la pensée critique d'un individu. Les différences entre les milieux où les concepts et les habiletés sont appris et les milieux où ils sont exercés font en sorte que les étudiants sont incapables d'identifier, de mettre en pratique et / ou d'adapter les concepts ou l'habileté appropriée lorsque des changements s'introduisent dans les circonstances. Malgré la nécessité d'un changement, la majorité de l'enseignement en sciences infirmières continue à se faire par des méthodes traditionnelles d'enseignement. Nombreux sont ceux dans la littérature qui prônent la nécessité de changer les méthodes d'enseignement, mais peu d'études ont été entreprises jusqu'à tout récemment avec des étudiants en soins infirmiers et aucune étude n'a été entreprise au CEGEP, situation propre au Québec.

Le but de cette étude fut d'explorer auprès d'étudiants l'effet qu'ont eu différentes stratégies d'enseignement sur la rétention, la compréhension et l'application des connaissances en leur enseignant le même sujet. Trois hypothèses

étaient soumises : (1) les étudiants qui reçoivent l'enseignement d'une connaissance et d'une pratique des soins de santé, telle l'asepsie médicale, par un apprentissage par résolution de problème (ARP) , réussiraient au moins aussi bien à un contrôle de rappel de connaissances post-intervention que les étudiants qui auraient appris le même sujet et la même pratique par une approche procédurale; (2) les étudiants "ARP" réussiraient mieux à un contrôle de rappel de connaissances lorsqu'administré ultérieurement; et (3) les connaissances apprises seraient mieux mises en pratique pendant leur expérience clinique par les étudiants "ARP" que par les étudiants de l'approche procédurale. À cet effet, une étude comparative portant sur deux approches d'enseignement d'une même technique en laboratoire a été menée. En utilisant la matière de l'asepsie médicale, un projet de recherche quasi-expérimental a été conçu pour étudier la rétention, la compréhension et l'application d'une connaissance au cours d'une session de seize semaines à l'automne 2009. L'échantillonnage retenu était un échantillon intentionnel et pratique de quinze étudiants en soins infirmiers de première session inscrits à un programme de six sessions dans un collège anglais à Montréal, Québec. Le groupe témoin, composé de sept participants, a étudié l'asepsie médicale pendant la première session de laboratoire grâce à une approche procédurale ou par cœur (la méthode traditionnelle) tandis que le groupe expérimental, composé des huit autres étudiants, a étudié le même sujet grâce à un apprentissage par résolution de problème (ARP) (méthode non-traditionnelle). La collecte des données a été faite durant la première, cinquième et dix-septième semaine de la session par le biais de trois contrôles de connaissances et de rappel. La performance des participants lors de la mise en pratique des techniques d'isolement basées sur le concept de l'asepsie médicale pendant leur expérience clinique de sept semaines (semaines dix à seize) a été observée directement par leurs professeurs cliniques, dont l'une était la chercheure, et a été mesurée à l'aide d'une grille d'évaluation.

En conclusion, la première hypothèse n'a pas été corroborée tandis que la deuxième et troisième l'ont été. Une différence marquée a été observée entre les résultats des deux groupes dans les deux premiers tests de rendement: le groupe témoin a mieux réussi que le groupe expérimental. Quoique le groupe expérimental ait eu des résultats moins élevés que le groupe témoin lors du deuxième test, il y a eu une amélioration globale de leur pointage comparé au premier test. Les résultats du troisième contrôle ont démontré qu'une approche ARP améliore la rétention et le rappel à long terme d'une connaissance. Quant à l'application d'une connaissance, les résultats suggèrent deux conclusions. On constate que l'approche d'enseignement utilisée n'a eu aucun effet sur l'habileté d'un étudiant à exécuter la tâche. Cependant,

l'enseignement ARP a entrainé une mise en pratique plus cohérente et plus autonome d'une connaissance dans des situations réelles et différentes du contexte d'apprentissage. Une conclusion accessoire fut le lien avec leur expérience antérieure. L'étude a démontré qu'une expérience antérieure de la réalité dans un champ connexe favorise l'habilité de ces étudiants à comprendre, à intégrer et à mettre en pratique la théorie. Bien que l'échantillon était petit, les résultats sont prometteurs et soulignent le besoin de poursuivre la recherche dans ce domaine.

DEDICATION

For my sister, Ainsa, brother-in-law, Leo Hepburn and nieces, Leah and Ainsa, who quietly supported and encouraged me throughout this process and offered me unconditional faith and love. Thanks for being there.

ACKNOWLEDGEMENTS

I would like to thank the following people without whom I would not have been able to complete this paper:

Carolyn Dellah for her gentle guidance and continuous support;

Robin Simmons for lending an ear and giving me the idea that sparked my research;

Michelle Maguigad for her support, discussions and commiseration;

Jean Costanzo and Mary Puddington for their contribution and support;

Karl MacGillivray for encouraging me to pursue this degree;

Angela Gavin and Günter Vanasse for their support and encouragement throughout this programme;

Mike O'Hara for his support and keeping me grounded;

My MTP colleagues, especially Sally Robinson and Maggie Mcdonnell, without whose support I would not have completed this programme;

My Fall 2009 Clinical nursing students for their participation;

Michelle/Robin's (aka Rochelle) Fall 2009 Clinical nursing students for their participation;

and Dawson College for permitting me to carry out my research project.

INTRODUCTION

The current landscape of health care is ever changing and becoming increasingly complex with the introduction of new technology into the workplace and more complicated patient situations. This has had an impact on the current state of the nursing profession. This along with the shortage of healthcare professionals, hospital mergers, downsizing, and a move towards more outpatient care has led to an evolution in the nursing role. Although the basic job description of nursing has not changed, its complexity, demands and interdisciplinarity has (Meeker & Byers, 2003). Health care employers, and ultimately society, are calling for newly graduated nurses to practice at a higher level of competence than previously expected. As well, these graduates are expected to be able to think critically.

Definitions of critical thinking abound in academic literature. However, all have based their research on the 1987 American Psychological Association's Delphi research project's definition of a critical thinker. The published definition by Fancione (1990) was:

> The ideal critical thinker is habitually inquisitive, well informed, trustful of reason, open minded, flexible, fair minded in evaluation, honest in facing personal biases, prudent in making judgements, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit. (as cited by Duchscher, 2003, p. 15)

Paul and Elder (2003), well-known authorities on critical thinking, defined critical thinking as:

> ...that mode of thinking – about any subject, content, or problem – in which the thinker improves the quality of his or her thinking by skilfully taking charge of the structures inherent in thinking and imposing intellectual standards upon them. (p. 1)

These definitions demonstrates that critical thinking is not discipline specific, but rather a state of thinking that is applicable to all aspects of life and education. Within the confines of the health care field, many believe that to think critically is synonymous with clinical judgement or decision making. In actual fact, critical thinking is a necessary component for clinical decision making. According to Lasater (2007), clinical decision making is the use of critical thinking in combination with nursing knowledge, skills, and attitudes to determine the appropriate action or intervention to be taken. Lasater further distinguishes clinical judgement as the focus of the nurse's evaluative and thinking processes to respond to a patient's situation (as cited in Dreifuerst, 2009). In other words, critical thinking is needed to be able to problem solve and act accordingly. The question is: how do nursing students learn to do this?

Nursing education is where the development of critical thinking and ultimately, clinical decision making for the nursing profession is to begin (Rush, Dyches, Waldrop & Davis, 2008). Within a three-year nursing program, students are expected to apply theoretical knowledge and skills learned in the lab to their clinical performance. During their clinical experience, these students are expected to make clinical decisions regarding their patient's care. It is not enough for them to possess the scientific knowledge and the procedural skills; the expectation is that they use both to intervene and provide the appropriate care for their assigned patient. In other words, students are expected to problem solve. One of the most important components of problem solving is to understand the nature of the problem. To do this, students need to have a high degree of knowledge of the topic or issue, meaning facts, principles, and concepts, and be familiar with the particular type of problem that they

are faced with. This will allow students to recognize the significant and related data within the problem thereby triggering the appropriate scheme(s) when needed (Snowman & Biehler, 2006). This means being able to recall and apply the appropriate principles and procedures. Thus to be able to problem solve, students must have an understanding of the relevant domain-specific knowledge.

To adequately prepare nursing students for the expectations of their chosen profession, nursing instructors need to use strategies that would promote and reinforce these skills. Student nurses as well as novice nurses tend to approach their practice from a task perspective rather than a problem-solving perspective. Therefore, they are not utilizing the concepts and principles being taught in the classroom to arrive at a valid and appropriate clinical decision. According to Newble & Clarke (1985), using a Problem-Based Learning (PBL) approach would center student learning on problems encountered in the profession rather than on the theory taught in the classroom separate from professional practice (as cited in Ramsden, 2003). With PBL, students learn by working in small groups and group discussions to identify the problem, discover the knowledge they need to make a decision and develop a solution to the problem; thereby, providing the students opportunities to incorporate theory with practice.

CHAPTER ONE: STATEMENT OF PROBLEM

Although there has been much written about the problems encountered within nursing education and its curriculum, three common problems have been identified by this researcher. First, nursing students do not appear to be able to discern a link between classroom theory and clinical practice. It has been noted by nursing faculty that nursing students have difficulty integrating and transferring theoretical knowledge and learned skills to their respective clinical areas. As the setting where these skills and concepts are demonstrated to the students differs from the environments where students are to practice them, many students have difficulty in recognizing, transferring and/or adapting the appropriate concept or skill when variations are introduced into the situation. The grading methods in the nursing program support the idea that theory learned in the classroom and labs are disconnected from hands-on application of said knowledge as the theoretical and the clinical components of the nursing program are evaluated separately. Students must achieve a passing final grade academically and receive a "satisfactory" for their clinical performance to successfully complete the nursing course. Students' official final grade will be their academic mark, if their clinical performance has been deemed "satisfactory". If students' clinical evaluation has been assessed as "unsatisfactory", then their official final grade will be 55% if they have passed academically or their actual academic grade, if it is less than 55%. Therefore, the consequences are minor if students pass academically and are able to perform satisfactorily within the clinical area.

The second noted problem is disciplinary segregation which is reinforced in the clinical experiences and observations of nursing students. Students learn and

develop the behaviours and values that are demonstrated by role models (Cronenwett, 2001). Within the many clinical areas that they are exposed to, students observe many different health professionals (i.e.: doctors, nurses, physiotherapists, etc.). These different health professionals who work and interact with each other and the students become the role models for students being educated in the different health care professions. These professionals from different disciplinary backgrounds and teams are regarded by the students as experts within the field; therefore, authoritative sources of knowledge, behaviour and values and thus, role models to emulate. In the clinical area, students frequently observe professionals of different disciplinary backgrounds involved in a specific aspect of a patient's care. Without observations or explanations to the contrary, students may come to believe that each profession is separate and isolated from the other rather than being interdependent and sharing a common language and goal; thereby strengthening the notion of disciplinary segregation. Another aspect of this segregation returns to the academic aspect - that of separating classroom theory and clinical practice. Professional performance is based upon knowledge and skills that are not easily expressed verbally and are dependent upon the situation (Benner & Sutphen, 2007). As was noted by Polanyi (1958), experts know more than they can tell (as cited by Benner & Sutphen, 2007). The interpretation and understanding of these actions is determined by the knowledge and experience of the individual. With experience, experts' actions or interventions become more intuitive and possibly routine. If the action is intuitive, it is difficult for them to explain the process and rationale(s) used to arrive at the action or intervention taken. On the other hand, if the action or intervention is routine, the expert may not remember that due to the students' inexperience an explanation is required. When observing the actions of their role models, students within the health care field, particularly nursing students, do not necessarily possess the knowledge required to see beyond the actions without a provided detailed explanation. Consequently, if no explanation is provided, which is frequently the case, what is emphasized in the clinical area is the task at hand which reinforces the idea of separation of theory/knowledge from the clinical area and practice. For example, within the

classroom and labs, students are taught the importance of hand hygiene prior to patient contact and/or procedures. Once within the clinical area, students may not actually witness health employees, particularly nurses, wash their hands prior to performing a procedure or coming into contact with a patient as this may have been done in another area. The relevancy of this concept could be emphasized or belied depending upon the approach of the instructor or the role model. If the instructor or the employee explain to students that hand hygiene was performed prior to the beginning of the contact and reiterate the associated theory, then this directs their attention to the necessary knowledge. However, if the instructor or role model fails to make this point, students question the pertinence of the theory as well as the practice. Unless the knowledge and the process that resulted in the action are explicitly described by the professional or the instructor, students only view the actions and the results; thereby, emphasizing the importance of the skills, but not highlighting the significance of the concepts and principles that are the foundation of these actions. For students, observation with no accompanying explanation reinforces the idea of segregation between actions/behaviours and theory; thereby, discrediting the relevancy and importance of connecting and using the underlying knowledge to their future work environment.

The crux of the third and final identified problem of this study is that the existing teaching strategies used in nursing education are mediocre. The profession of nursing is currently advocating the use of evidenced-based practice where the practitioner bases actions and/or behaviours upon collected data and scientific foundations of patient care (McGarth, 2002). This type of practice requires the nurse to recall and comprehend the principles and concepts from the various related disciplines "learned" during his/her nursing education as well as work together with professionals from other disciplines for the good of the patient. However, if throughout their education this behaviour/skill is not modelled, practiced or reinforced, how can they learn to make appropriate and valid decisions regarding patient care?

The goal of nursing education is for graduating students to have the ability to make sound clinical decisions regarding the care of their assigned patients based on domain-specific knowledge, concepts and principles. Many nursing programs and curricula continue to maintain that knowledge transmitted to students will somehow be transformed by students into practical and applicable knowledge (Candela, Dalley & Benzel-Lindley, 2006). However, it has been noted by nursing faculty that nursing students have difficulty integrating and transferring theoretical knowledge and learned skills to their respective clinical areas. Thus, to achieve the desired outcome of nursing education, there must be a change in teaching strategies that focuses on student learning inductively rather than the rote transmission of knowledge. This adds the dimension of being able to utilize the knowledge to the ability to recall relevant knowledge. The PBL approach brings these two elements together as students, working in small groups, have to identify the problem, discover/recall the knowledge needed for decision-making and then generate a viable solution.

CHAPTER TWO: CONCEPTUAL FRAMEWORK

1. Active Learning

Throughout the literature, it is argued that students learn better and are more committed to learning when they are actively involved in the learning process and with the course material. Being actively engaged in learning increases the probability of understanding and retention. Research has shown that students construct new knowledge from their experiences and existing knowledge (Phaneuf, 2007; Graffam, 2003; Chang and Chang, 2008). Both Phaneuf (2006) and Graffam (2003) contend that giving students the opportunity to apply what they have learned permits them to integrate new knowledge and skills into their mental representations of reality and integrate these concepts into their knowledge base. Along the same vein, Ibarreta and McLeod (2004) proposed that taking responsibility for learning is central to critical thinking and a prerequisite for the development of knowledge and understanding in students. In the beginning, students focus on their needs and base all interactions on their own personal experiences. Being actively involved in real life situations provides them opportunities to broaden their view of themselves and to look at situations from different perspectives (Sedlak, Doheny, Panthofer & Anaya, 2003). Sewchuk (2005) and Candela, Dalley and Benzel-Lindley (2006) also supported the position of placing the emphasis on using knowledge to deal with real-life situations or problems. This should promote student interest and actively engage them in the process of learning. As well, the responsibility of learning changes from solely that of the teacher to both the students and the teacher. This will result in students constructing and retaining new knowledge.

2. Peer Collaboration

Vygotsky asserts that peer interaction is an important factor in the construction of knowledge. For Vygotsky, interactions with peers, parents and teachers are the major forces that shape an individual's learning (Snowman & Biehler, 2006). As Kegan proposes, the basis of an individual's sense of self is founded in the ideas, theories and expectations of others (as cited in Haynes, 2002). In the beginning, students focus on their needs and base all interactions on their own personal experiences. However, Redding (2001) stated "...students need to be socialized into acquisition of a critical-thinking disposition that will inspire their independent application of critical-thinking skills in unfamiliar environments without the support of faculty or student peers after graduation" (p. 63). Being actively involved in fieldwork provides them opportunities to broaden their view of themselves and look at situations from different perspectives (Sedlak, Doheny, Panthofer & Anaya, 2003). Students become more aware of their own thoughts, ideas and beliefs during discussions with their peers as they must organize thoughts and express their views coherently to others. Through these discussions, students will construct a common understanding (Phaneuf, 2007; Graffam, 2003). Su, Masoodi, and Kopp (2000), university nursing professors described an approach that they used to help students apply learned content to their respective clinical areas. They found that group discussions aided students in identifying reasoning used in different situations by allowing them to compare their own experiences with those of their peers. Students would explain how they arrived at their initial diagnosis and provide supporting rationales. Students would then examine their thinking based on the feedback from both the teacher and peers. In this sense, facts are not just given, but rather they are analyzed and processed by the learner and eventually applied in real-life clinical situations (McGarth, 2002). Having students work together to discuss principles and determine how they should and would be applied in different situations that may be encountered in their professional world promotes interest and motivation

in the subject matter and ultimately, a deeper approach to learning these principles. Various researches suggest that it will result in students constructing and integrating new knowledge.

3. Problem-Based Learning

One of the ultimate goals of education is learning and transfer of knowledge. For students to be able to transfer knowledge, they must possess a knowledge base that is not bound by facts learned from one domain, but crosses a variety of disciplines. This knowledge must be flexible in that students are able to recall and apply it when necessary in various situations. This flexibility will be developed through the construction, integration and application of knowledge by students. These skills are promoted when students are actively involved, actively participate, interested in the subject matter, and able to perceive the relevance of the knowledge to their world. Traditionally, educational approaches, such as rote or procedural learning, have placed the emphasis on teachers and memorization, thereby promoting student passivity and decreasing the likelihood of knowledge retention. In speaking of the current challenges faced by nursing instructors and students, McGarth (2002), an assistant nursing professor, asserted educational activities were needed that would allow rehearsal of skills for learners to become competent and confident in their capabilities. In the current climate of nursing education, students need to acquire domain-specific knowledge, develop critical thinking and clinical decision making and apply these skills in a real-world clinical situation. The Problem-Based Learning approach (PBL) provides a method for teaching these skills required by students to become a nurse (McGarth, 2002).

In psychological and educational research, the importance of practical experience in learning has long been advocated as a means for students to learn how to problem-solve (Hmelo-Silver, 2004; Phaneuf, 2007; Walsh & Seldomridge, 2006;

Sewchuk, 2005; Redding, 2001; Hom, 2003; Ironside, 2005; Vakil, 1998). Traditionally in nursing, a procedural approach, where a concept or a skill is taught through sequencing or staging instructions, is used. This method focuses on the memorization of the sequence. The ability to recall facts is thought to be evidence of learning and therefore, an indicator of thinking. The PBL approach is a method of providing learning along with rehearsal and practice time (McGarth, 2002). This instructional approach was originally developed for use within the health sciences education. The goal was to be able to place students into complex situations. It was first implemented McMaster University's medical program and is currently incorporated into the curriculum of many medical schools world-wide. Creedy, Horsfall and Hand as well as Rideout and Carpio have identified PBL as one of the most promising instructional approaches for teaching nursing (as cited in Anderson & Tredway, 2009).

Barrows, a professor in an American school of medicine, has defined PBL as "experiential learning organized around the investigation, explanation, and resolution of meaningful problems" (as cited in Hmelo-Silver, 2004, p. 236). In PBL, students, working in small, collaborative groups, learn through facilitated problem solving. This approach requires students to identify the problem and collect data required to deal with it. Together, students work to develop a solution by identifying what they need to know (Hmelo-Silver, 2004). As Anderson and Tredway (2009) ascertained, many descriptions of the steps of PBL are available; however, all agree upon its fundamental characteristics. The relevant PBL characteristics for this study include: (1) the identification of the need for learning a particular skill by the student and/or student group; (2) the effect of learning to problem solve within the context of a relevant situation; (3) the cognitive load of group or peer collaboration and (4) the teacher as a facilitator (Anderson & Tredway, 2009).

3.1. Identification of the Need for Learning

Self identification of the need for learning has a three-fold effect. First, it intrinsically drives students to acquire new knowledge which shifts the focus of learning from memorization to comprehension. Students are no longer passive receptors of knowledge, but rather are actively participating in learning as they actively seek the necessary knowledge to solve the problem. In this situation, the reward is not marks (extrinsic reward), but being able to generate a hypothesis and a solution to the problem. Therefore, students are motivated by the intrinsic reward of a sense of accomplishment for solving the problem. Second, this characteristic provides an opportunity for the teacher/facilitator to present key information to students when they (the students) have realized the need for the information and its relevance to solving the problem at hand. This just-in-time learning promotes knowledge construction and retention (Hmelo-Silver, Duncan & Chinn, 2007). Finally, it gives students control over and makes them responsible for their learning. Students decide how they will approach the problem as they decide what they need to know, when they need to know it, and how and what type of resources they will use to find the necessary information (McGarth, 2002). Both Bandura (1997) and Dweck (1991) asserted that student motivation is promoted when they believe that they have control over the learning outcome (as cited in Hmelo-Silver, 2004). Thus, the understanding of the need for knowledge gives students motivation to learn and a sense of accomplishment and results in students being actively involved in their learning; thereby, making them active partners in the process.

With regards to learning, Confucius stated, "Tell me and I will forget, show me and I may remember; involve me and I will understand" (as cited in Hmelo-Silver, Duncan & Chinn, 2007).

3.2. Context of the Problem

The context of the problem is an important aspect of this approach. Situating the problem within a real-life situation that may be encountered by students makes the knowledge concrete and relevant for them. Instead of the knowledge being abstract with the possibility of it being useful in the future, students are given an immediate opportunity to apply the knowledge; thereby, demonstrating its (knowledge) usefulness to students. This piques their interest and motivates them since the outcome is attainable and concrete (Bandura as cited in Hmelo-Silver, 2004). As well, having the opportunity to actually apply the knowledge increases the probability of its retention supporting the adage of "use it or lose it". Another feature of using a real-life problem is that it provides students with practice in dealing with a complex situation within their chosen field. The context in which learning takes place influences the ability of students to access the knowledge when needed in the future. These real-world situations provide students the chance to engage in the actions needed for solving problems, which are questioning, exploring, clarifying and arguing, within a context similar to that in which the knowledge will be used. In using this approach to teaching nursing skills, Clarke and Davies (2009) stated that students not only gain psychomotor learning, but also receive holistic experiences that duplicate those commonly encountered in the field of nursing. Hence, students get rehearsal time as well as learn "content in a relevant and motivating context" (Hmelo-Silver, Duncan & Chinn, 2007).

3.3. Group Collaboration

Group collaboration within PBL addresses the social aspect of learning. The most explicit benefit of working in groups is that the cognitive load is distributed among the group members. In having groups work on a problem together, it allows everyone's expertise to be used to solve a problem that would have been too complex

for an individual student to solve on their own (Hmelo-Silver, 2004). A more important benefit of peer collaboration is what each student is exposed to. As students work together to find a solution to the problem, they are exposed to ideas and experiences of others. With the exposure to different views, students become aware of their own thoughts in relation to others (Phaneuf, 2007). This allows students to reflect upon what they have learned and discuss their views (Phaneuf, 2007; Anderson & Tredway, 2009). Through discussion, prior relevant knowledge is activated and facilitates the processing of new information (Schmidt *et al* as cited in Hmelo-Silver, 2004). Students analyze the situation or problem from multiple perspectives, drawing from different disciplinary knowledge in search of understanding and a solution. Bransford and McCarrell noted that knowledge construction is enhanced when students can connect it with what they already know (as cited in Hmelo-Silver, 2004). Another aspect of working collaboratively in a group is functioning as a team. In working together, students learn how to communicate with each other, negotiate and resolve differences. Students learn to present, explain and support their ideas to other group members, thereby reinforcing their own learning. In the end, this promotes students constructing a common and new understanding that they will apply to the current problem and future similar problems (Phaneuf, 2007; Graffam, 2003; Anderson & Tredway, 2009).

3.4. Role of the Teacher

With PBL, the focus of the activity (and education) shifts from teacher- or content-centered learning to student-centered learning. In this type of learning, the teacher's role changes from being the principle source of knowledge to that of a facilitator. Students seek answers to their questions from themselves, their teacher, others and outside sources. Within this environment, the teacher becomes a facilitator. As a facilitator, the teacher's task is to help students acquire the appropriate knowledge (Phaneuf, 2007). Initially, the teacher imparts the necessary

information when students recognize the need for information (just in time learning). This can take the form of direct instruction, such as a mini lecture, and/or role modelling. For modelling, the teacher/facilitator demonstrates the type of questions that students should be asking, provides examples, and shows any skill or procedure necessary to complete the task (Hmelo-Silver, Duncan & Chinn, 2007; Phaneuf, 2007). As students become more adept at the process, the teacher/facilitator becomes the "guide on the side" (McGarth, 2002). Without directly providing the answer, the teacher/facilitator supports and guides students' progress through acquiring knowledge and solving a problem through coaching, providing hints and examples, and using Socratic questioning (Hmelo-Silver, Duncan & Chinn, 2007). In this manner, the teacher/facilitator involves students in the task, the concepts, their peers and their learning process.

In conclusion, a PBL approach encompasses and utilizes the concepts advocated by research to promote retention, application and transfer of knowledge. Hmelo-Silver (2004) stated that when this approach is used, "students are asked to put their knowledge to use and to be reflective and self-directed learners."

CHAPTER THREE: LITERATURE REVIEW

1. Student Learning

Traditionally, education of health professionals, and in particular nursing students, is focussed largely upon transmitting disciplinary knowledge, following the trend of postsecondary education. Teaching and learning in these fields are a combination of formal/traditional and experiential learning. Students are expected to integrate knowledge, skills, and ethics. However, lecturing for the sake of covering content and possible cognitive development tends to promote student passivity and lessens the probability of retention (Mikol, 2005). Over the past twenty years, educational research has advocated student-centered or learning-centered education (Candela, Dalley & Benzel-Lindley, 2006; Phaneuf, 2007; McGarth, 2002; Hmelo-Silver, Duncan & Chinn, 2007). This type of education shifts the focus from teaching to learning and the student. According to Candela, Dalley, and Benzel-Lindley (2006), this places the emphasis from "simply knowing to be being able to do" (p. 60). This idea is the one of the primary goals of nursing education. Again, if this is the desired outcome, then how are students to achieve this?

1.1. Active Involvement and Participation

Students learn and make meaning from reflection on experiences. According to Piaget, students construct new knowledge from their experiences and existing knowledge (Phaneuf, 2007). Similarly, Beane (1997) theorized that people's ideas

about themselves and the world are constructed from their experiences. Therefore, if this idea is extended to students, they grow from their experiences, learn from their mistakes and decide how to adapt the new knowledge to different situations (Phaneuf, 2006). Active participation allows students to apply and practice theoretical content. In doing so, students experience the applicability or relevancy of content matter to real-life contexts; thus, allowing theory to come to life and constructing new knowledge by integrating new concepts with prior knowledge or experience.

Harpaz, Balik and Ehrenfield (2004), nursing instructors in Tel Aviv, conducted a comparative study. In this study they compared the effects of concept mapping to traditional teaching strategies used in nursing education on facilitating students' comprehension of new concepts through literature and nursing instructors' and students' experiences and opinions. In concept mapping, the learner connects new concepts to existing knowledge through diagramming resulting in meaningful learning. Teachers found that when students were more actively involved with the concept mapping approach it helped them (students) organize the material in an integrative way. With the use of this method, students reported an increased depth of theoretical knowledge, an ability to connect this knowledge to different areas of their education, and having more confidence in applying this knowledge in their clinical practice. Similarly, Siu, Saschinger and Vingilis (2005) found in their comparative study of 108 basic nursing students enrolled in their final year of a baccalaureate program in two Ontario universities that nursing students in a PBL program, having been actively involved in increasing their knowledge through group discussions, identifying learning goals and doing self-directed activities, had a higher sense of empowerment and believed that they had better clinical problem-solving skills than students in a traditional or conventional nursing program.

Chang and Chang (2008), Taiwanese professors of Psychology, studied the effect of concept mapping activity (CMA) on graduate students' learning outcome by comparing the marks of concept application assignments between CMA and non-

CMA groups of ninety-seven graduate students registered in one of six classes of an online course taught by the same instructor. It was found that the CMA group obtained significantly higher scores on these assignments than the no-CMA group. These results show that CMA which actively involves students in their learning increased the learning outcome as well as students' ability to apply the concepts. As nursing education is both theoretical and practical, it lends itself to students being actively involved in their learning (Jerlock, Falk, & Severinsson, 2003).

In the beginning, nursing students rely on rules to guide their practice. Often, they approach a situation from a task-oriented perspective rather than from a problem-solving perspective making it difficult for them to transfer nursing knowledge to their clinical practice (Su, Masoodi & Kopp, 2000). For example, Duchscer (2003), a nursing faculty member of a large Saskatchewan university, conducted a qualitative study of five newly graduated baccalaureate nurses exploring nurses' perception of critical thinking within the first six months of entry into the profession by accompanying them through their first six months of nursing practice. It was found that at the beginning, the participants required direction as to what, how and when to do something. They "associated meaning with doing" (Duchscher, 2003, 17). They thought that rules would be enough to guide the care they provided to their patients. Approximately three months into the six month study, the participants began to demonstrate the ability to take on more responsibility for their actions and question as well as disagree with those who they perceived as authority figures or experts.

Walsh and Seldomridge (2006) studied the growth of critical thinking in nursing students in a midsized American public university over an eight year period (from 1997 to 2002). It was noted that often students would collect patient data, present it to their instructor, and then follow the instructor's or staff's directions, rather than thinking for themselves. One of the recommendations that came from this study was thinking should be promoted in the clinical setting through faculty modelling clinical decision-making and by faculty challenging "...students to use

more complex reasoning, applying principles rather than regurgitating facts" (Walsh & Seldomridge, 2006, p. 217).

For learning to occur, experiences must be transformed either through reflection of actions or through active experimentation (Sewchuk, 2005). Students need time to solidify their skills. Therefore, students need to be exposed to situations that support the application of critical thinking in unfamiliar surroundings (Redding, 2001). The clinical portion of the nursing curriculum, with exposure of students to real-life situations as the basis for training and learning, provides this needed practice and rehearsal time.

In their qualitative study of ninety-four first semester baccalaureate nursing students, Sedlak, Doheny, Panthofer and Anaya (2003) looked at the development of critical thinking in relation to community service combined with academic learning. Students were placed in community settings that ranged from daycares and nursing homes to Meals on Wheels and the American Red Cross where they were to provide fourteen hours of service that would be appropriate and necessary for the assigned setting. Each student was to keep an ongoing written journal connecting theory to service/experience and at the end of the course, he or she had to present a poster chronicling the experience by the student's goals and implications for nursing practice. These were used to evaluate the experience. It was found that students were able to identify different aspects of health promotion and to utilize the theoretical content regarding health promotion learned from their nursing course. Also, this type of learning experience allowed students to develop a bond with the community and a new meaning for the curriculum making the usefulness and significance of classroom theory more apparent.

Similar results were seen with other studies about the development of critical thinking; however, the implementation was different. In her qualitative study of the impact of reform on students' thinking, Ironside (2005), an assistant professor of

nursing in a Wisconsin university, used data from two studies related to using new pedagogies, one of which was Narrative Pedagogy. Data was collected through interviews of thirty teachers and fifteen students from all levels and types of nursing programs. In a description of a teacher's experience of bringing a guest with a disease into a health assessment class without prior student preparation, it was noted that this approach brought the topic and the theory alive, actively involved the students as well as the teacher in the process, and demonstrated to students how context, knowledge and thinking were linked in nursing practice. The narrative strategies allowed students and teachers "...to practice interpreting, questioning, and thinking in the context of nursing" (Ironside, 2005, p.447) thereby engaging students' interest. It was also found to bring multiple perspectives as students were not only focused on identifying the guest's symptoms, but also "... listening and understanding the visitor's experience and thinking." (Ironside, 2005, p.445) With respects to the introduction of content, Schwartz and Bransford (1998) found that individuals who were given opportunities to experience situations in which the knowledge was useful prior to the related assignments or lecture performed better on tests of learning transfer (as cited in Ironside, 2005). This was also supported by Vakil, Hoffman and Myzliekm (1998) who compared the ability to perform a memory task of both older and younger adults when trained actively versus passively. In this study half of each group were trained actively by having them actively involved in solving a puzzle and the other half were trained passively by solving the same puzzle by following verbal instructions. The impact of the training was tested immediately and one week following the training. Additionally, the groups' performance was measured on a more complex version of the puzzle. It was found that active training resulted in better performance on the more complex task than passive training (Vakil, Hoffman & Myzliekm, 1998).

Nursing students as well as novice nurses have limited clinical experiences and therefore have few patterns in their memory to refer to (O'Neill, Dluhy & Chin, 2004). With continued exposure to similar experiences, novices begin to link cues

together and develop relationships between textbook knowledge and experiential knowledge (Hom, 2003; O'Neill, Dluhy & Chin, 2004). Active participation by students in their learning provides a more holistic educational experience as it enhances their ability to connect and use the knowledge thereby making the knowledge and concepts discussed in the classroom relevant and meaningful to them (Redding, 2001).

1.2. Relevancy

When concepts and facts are learned in abstraction, the probability of its retention is low. Ironside (2005), an American nursing professor, hypothesized that the reason students have difficulty recalling and applying facts in clinical situations is because these facts were memorized without any knowledge of the context of actual clinical situations that give facts and concepts meaning. Students come to believe that nursing care can be understood and undertaken in a predictable, step-by-step fashion (Ironside, 2005). As Walsh and Seldomridge (2006) pointed out, clinical skills can be memorized as sequences of action, but students may not recognize the need for said skills when they are presented with situations that do not duplicate those in which the skills were learned in/with. Therefore, can it be said that learning has taken place? As suggested by Donald (2002), student learning is influenced by the disciplinary context. Providing students with a problem to solve that they would encounter within their profession or world should place the new knowledge into context and make it relevant to students. The new information becomes concrete rather than abstract and in so doing, becomes that much more accessible. The focus of learning for students shifts from memorizing to actively searching for answers to aid in developing a solution. When understanding is the focus, students attempt to incorporate new knowledge with prior knowledge; they try to form connections between theory and the real world. In this fashion, students are encouraged to "reconcile and synthesize the differing disciplinary and nondisciplinary worldviews" (Haynes, 2002, pp. 2-3).

This increases the probability of knowledge retention and comprehension. This was supported by Cowman's (1998) study of 1122 Irish nursing students that compared the learning approaches of a traditional apprenticeship nursing program where student nurses were employed by a hospital or health board and "Project 2000" a nursing program where nurses graduated with a diploma in higher education. The apprenticeship training exposed student nurses to various clinical situations where they were able to apply their newly acquired domain-specific knowledge while at the same time earning a salary. Those students who were trained in a more academic environment (Project 2000) were exposed to more examinations and assessments than those in the traditional type of training. Cowman, a lecturer in an Irish nursing faculty, reported that both cohorts scored similarly on scales of comprehension learning. However, there were significant differences noted in other areas. The apprentice cohort scored significantly higher on scales of operation learning than the academic cohort. This score meant that that the apprenticeship student nurses demonstrated a mastery of procedural techniques including rules, methods, and the ability to "build concepts from isolated topics" (Cowman, 1998, 906). This same cohort also had higher scores on the subscales of relating ideas and use of evidence. Cowman found that this reflected students actively relating to what was being learned, and actively attempting to connect theoretical knowledge with real life as well as attempting to link new knowledge or information to previously learned knowledge. Therefore, having students apply new knowledge makes it relevant to their world and promotes the retention and comprehension of the knowledge.

1.3. Interest and Motivation

There are two other aspects of situating a problem solving activity within the realm of their chosen profession: interest and motivation. For retention to occur, students must be interested and engaged in the subject matter. Ramsden (2003) states that "...interest and a sense of ownership of the subject matter provide fertile ground

for attempts to impose meaning and structure." (p. 65). Having chosen to enter a nursing program, interest in the subject matter should already be inherent in students. Ramsden (2003) and others noted that a student's approach to learning is influenced by their experiences of learning as well as their interest. Wiggins and McTighe (1998), well-known American educators and developers of the Understanding by Design framework, contend that students became more engaged when the assigned activities had direct implication on their lives (as cited in Anderson & Tredway, 2009).Therefore, providing students with a problem that they would encounter within their profession or world should engage their interest as the theme becomes making connections with students' life (Graffam, 2003). For example, in Cowman's (1998) comparative study of student nurses trained using an apprenticeship approach versus an academic approach, those students in the apprenticeship training program had higher mean scores for intrinsic motivation, deep approach to learning and use of evidence than students in the more academically-focussed program. This suggests that students placed in real-life situations that were in the context of their chosen profession were more involved in and focussed on connecting their new knowledge with their actions and/or behaviour.

Pardue (2008) also noted that the new generation of college students prefer "active and engaging activities" rather than the traditional lecture approach to maintain their attention and interest. The use of technology in the classroom has led to students' expectation of the availability of prepared lectured notes and being entertained while in class. In the short term, students' interest is maintained, but this strategy reinforces passivity in students as they again become receptors of knowledge (Walsh & Seldomridge, 2006). This is not to say that learning content is unimportant, but if this remains the principle focus of student learning instead of understanding and being able to apply the knowledge, then the difficulty of encouraging students to search for, construct and use knowledge will continue (Candela, Dalley, & Benzel-Lindley, 2006). Without interest, students will not be motivated to learn.

Motivation is a key to academic success. The type of motivation for learning influences the approach that students take towards learning. Two types of motivation have been identified: intrinsic and extrinsic. Intrinsic motivation comes from within an individual. It is satisfaction that an individual feels from his/her own work (Sanacore, 2008). Extrinisic motivation is goal-oriented behaviour. Satisfaction comes from the external rewards (i.e. grades, praise) that an individual receives for his/her own work. These types of motivation are associated with two types of approaches to learning: (1) associated with intrinsic motivation is a deep approach which is a student strategy or method of learning where the main intention is to find meaning; they use existing knowledge and experience to build a connection between existing knowledge and new principles, and (2) associated with extrinsic motivation is a surface approach where the main method of learning is the memorization of material and information without any attempt at making meaning or connections with it. The goal is to obtain a tangible reward. (Chang & Chang, 2008). Although extrinsic motivation may be necessary to catch the learners' attention initially, if students are to value learning and become independent learners, they need to grow and become intrinsically motivated (Sanacore, 2008).

McGarth (2002) argues that the process of gaining knowledge, rather than the content, has a more lasting impact on the learner as they are developing problem-solving skills along with acquiring specific knowledge. Therefore, a deep approach to learning should be encouraged. Both Chang and Chang (2008) and Cowman (1998) concurred and found that a deep approach to learning is promoted if an intrinsic motivation exists. In Cowman's study of the different approaches to learning among Irish nursing students, the cohort that received the traditional, apprenticeship training had higher scores on measurements of intrinsic motivation as compared to the more academic cohort. These scores demonstrate that the aim of these students was comprehension of new knowledge (Cowman, 1998). Along with getting students actively involved in their learning, having them work on a problem that is professionally relevant has students personally invested in the outcome. This

promotes a sense of ownership and responsibility to solve the problem; thus, encouraging intrinsic motivation. It also encourages interest and task persistence (Sanacore, 2008). Graffam (2003) in his study of the introduction of Teaching for Understanding framework at an International baccalaureate school in Florida and Harpaz, Balik & Ehrenfeld (2004) who studied the effectiveness of cognitive maps with university nursing students, argue that this approach to learning results in an increased probability of retention and comprehension of knowledge as well as a higher probability of appropriate application and transfer of this knowledge. Therefore, one of the main responsibilities of teachers is to encourage and promote active involvement and intrinsic motivation in their students.

2. Teacher's Role

Student-centered learning (which is advocated by educators today) necessitates a role change for teachers as the focus of the classroom changes from teaching to learning. Traditionally, a teacher is viewed as the principle source and transmitter of knowledge. In this new approach to learning, it is the student who takes the leading role as they orchestrate their learning (Phaneuf, 2007). The teacher is no longer considered an expert in the field or content, but is rather an expert learner who is able to model strategies for learning, questioning, and thinking (Hmelo-Silver, 2004). The teacher becomes a facilitator who scaffolds student learning and progresses the learning experience from simple to complex. To promote learning, Sanacore (2008), as well as others, recommended that students' interests should be incorporated into the curriculum. To garner interest, it is recommended to aim instruction slightly above students' capabilities. A facilitator helps students develop a process for acquiring knowledge by providing them with opportunities to aid in this endeavor. (Phaneuf, 2007). In this manner, the teacher-facilitator scaffolds student learning and progressively withdraws his/her help as students gain experience (Hmelo-Silver, 2004). Phaneuf (2007) describes scaffolding as "a process of

guidance, support and reinforcement that helps the student overcome difficulties, master … ways of studying and … techniques of working and to become aware of the progress…" (p. 5) being made. With the teacher's guidance and support (which includes scaffolding), students are able to master new concepts that they would have been unable to do by themselves (Phaneuf, 2007; Walsh & Seldomridge, 2006). Originally, a task force tracked the development of critical thinking in nursing students of a midsized American university over an eight year period (1997 to 2002). When the analysis of the data proved to be inconclusive, Walsh and Seldomridge (2006) focussed on the role and development of critical thinking in nursing education. They explored whether critical thinking was being strengthened in the classroom and clinical experiences by looking at the type of thinking promoted in the classroom and in the clinical areas as well as the impact of technology in the classroom on critical thinking. In their discussion, they extended the concept of scaffolding by noting that although initially it may be necessary to supply students with facts to provide a foundation to function within a clinical setting, to continue to do so would not teach them how to do so autonomously. This supports the necessity of progressively changing the focus of teaching from transmitting information/knowledge to teaching how to find and apply the knowledge. Initially, the teacher's role would be to impart knowledge necessary for common clinical situations, but this role would change to assisting students in discovering the answers to their own questions. Therefore, the teacher-facilitator must arrange or develop a learning activity that is challenging, yet achievable. It should be relevant to the topic under discussion and the environment should be encouraging and supportive. This would stimulate and motivate students to be responsible for their learning as they would have to be actively searching for information.

Another role of teachers within the student-centered approach to learning is that of being a role model. In guiding students to acquiring knowledge, teachers can model the appropriate approach and/or action. In the case of nursing students, the teacher facilitator would model procedures and techniques as well as the type of

questions which students should be asking of themselves to further their learning. In the recommendations of their study of the development of critical thinking of nursing students within the classroom and clinical settings, Walsh and Seldomridge (2006) suggested that teachers "think aloud" in the clinical area when clustering and analyzing data, and developing a hypothesis and a plan for care. This would model for students how to solve a problem, how to be proactive within a clinical setting and decision making. Then having students demonstrate this process in new situations would provide an opportunity to develop this skill. In her study on the impact of a clinical expert on the development of novice nurses, Hanneman found the demonstration of interventions by an experienced nurse was one of the factors that facilitated the development of skills quickly in novice nurses (as cited in O'Neill, Dluhy & Chin, 2005). Modelling has a two-fold benefit for students. With modelling, a teacher provides students with a clear direction to refer to in future instances that are similar without giving them the answer to the problem or question (Phaneuf, 2007).

Phaneuf concluded that "...the role of the teacher is only to create situations that encourage learning, to direct students towards useful resources, to advise them and to fill the gaps in their knowledge" (as cited in Phaneuf, 2007). A teacher cannot force students to learn; students are responsible for this as it is an internal process. To allow them to think for themselves allows them to construct their own thoughts and ideas and shows respect for their abilities (Phaneuf, 2007).

3. Research Question

This study investigated whether first year nursing students recall/retain, apply and understand the concept of isolation and medical asepsis more effectively when learned through a PBL approach or a procedural approach. The concept of medical asepsis is "all practices intended to confine a specific microorganism to a

specific area, limiting the number, growth and transmission of microorganisms" (Kozier, 2004, p. 744). The concept of isolation is breaking one of the links in the chain of infection by interrupting the method of transmission of microorganisms. There are six methods of transmission. They are: (1) direct transmission where microorganisms are transferred from person to person through body surface to body surface contact (i.e. touch, bite, kiss or sexual intercourse); (2) indirect transmission where microorganisms are passively transferred from the reservoir to either an inanimate object or material to the recipient (i.e. hands touch contaminated doorknob and transfer to recipient's mucous membrane); (3) droplet transmission where large droplets of respiratory secretions are projected a short distance (i.e. sneeze or cough) and deposited into the conjunctiva or mucous membranes of eye, nose or mouth of recipient; (4) air-borne transmission where microorganisms are transferred by air currents to person by inhaling either evaporated droplets produced by an infected individual or dust particles containing the infectious agent; (5) vehicle-borne transmission where infectious agents are transported and introduced by an intermediate measure (i.e. inanimate objects or material, food, water or blood); (6) vector-borne transmission where the infectious agent is transported by an animal or insect (Kozier, 2010, pp. 885-886). When considering isolation, there are routine practices and additional precautions that are utilized. These precautions are measures used or practiced to prevent the spread of infections or suspected infections to health care employees, patients and visitors. Routine practices are those used when caring for any patient "regardless of their diagnosis or possible infection status" (Kozier, 2004, p. 762). When caring for a patient with a suspected or known infectious process, further precautions are required in addition to the routine practices to reduce the risk of transmission of microorganisms from known and suspected sources and are based upon the method or route of transmission. These additional precautions are subdivided into (1) airborne precautions which are used when working with patients known or suspected of having a disease process that is transmitted by small airborne droplets (i.e. measles, varicella); (2) droplet precautions which are used in instances where the patients have an illness that is transmitted by particle droplets (i.e.

pertussis, influenza); and (3) contact precautions which are used when being exposed to an illness that is easily transmitted through direct contact with the infected patient and/or items within the patient's environment (Kozier, 2010, p. 913-914).

As explained earlier, a PBL approach is a teaching method where students learn through peer-collaborated problem solving facilitated by a teacher (Hmelo-Silver, 2004). A procedural approach is an instructional method where a concept or a skill is taught through sequencing or staging instructions. The main focus of this method is memorization of the sequence.

In short, the research question for this study was: do first year nursing students recall, understand and apply the concept of isolation and medical asepsis better when a PBL approach or a procedural approach is used?

This study hypothesized that (1) students who received knowledge about a specific nursing concept and practice, such as medical asepsis, through a PBL approach would perform at least as well on tests of knowledge recall immediately post intervention than students who learned the same concept and practice by a procedural approach; (2) "PBL" students would perform better on future tests of knowledge recall; and (3) "PBL" students would apply their knowledge better during their clinical experience than the "procedural" students.

CHAPTER FOUR: METHODOLOGY

1. Introduction

This comparative study was a mixed method research design using both quantitative and qualitative methods of collecting and analyzing data. A quasi-experimental design was used to compare nursing students' retention, comprehension, and application of learned concepts using a traditional (procedural or rote) approach and a constructivist, non-traditional (PBL) approach. The data collected through results of achievement tests and observations of performance of isolation precautions was measured on ordinal and ratio scales.

2. Population, Sample and Participants

The competencies and the exit profile are the same for nursing programs in all colleges within the province of Quebec. When the competency-based programs were implemented in the province, the ministry left the decision of where each of these competencies is to be achieved to the individual colleges. Therefore, the difference between the nursing programs, besides faculty members and textbooks, is the timing of when each competency is to be achieved. The graduates of these programs must pass the same licensure exam to be able to work within the nursing profession. Therefore, the target population of this study is all students registered in a college-level, three-year nursing program in Quebec. The specific sample was drawn

from the first-year, first-semester, nursing students of an Anglophone college (Dawson College) in Montreal, Quebec.

There were 124 students entering the nursing program during the fall 2009 semester. The majority of students entering this program were female, culturally diverse, and ranged in age from 17 to 50 years old. Some already worked within the health care field in some capacity, others had changed programs, still others had already completed a postsecondary education (either collegial or university) in a program other than nursing. Due to the number of registered students in the course, the teaching team consisted of eight full time positions whose duties included lecturing as well as supervising students in the clinical areas. For their lab instruction and clinical experience, these first-year, first-semester students were divided between two lab/clinical days (Tuesday and Wednesday) and eight clinical teachers, one of whom was the researcher. As there were to be 61 and 63 students for the respective clinical days, each clinical teacher was assigned a group of seven to eight students per clinical day for the semester; therefore, each teacher had a total (maximum) of 16 students assigned to them.

A convenience sample was used for this study. This meant that the sample included students assigned to the participating clinical teachers, one of whom was the researcher. Since no prior information (i.e. academic marks, prior education) of these students was available, the clinical groups could be considered as being randomly assigned by two teachers from the first-year team. Thirty-one first-year nursing students were invited to participate in this study. Twenty-two responses were received and a total of eighteen consented to take part in the study initially. Eight participants within the control group received traditional instruction, based on procedural learning, on the topic of medical asepsis where students focused on learning and memorizing isolation procedures through a sequence of instructions. Ten participants assigned to the experimental group were taught the same topic, but a PBL approach was used where they were required to construct and practice isolation

procedures when given scenarios that simulate/represent different modes of infection transmission (see Table 1). However, the sample decreased to fifteen by the twelfth week of the semester, due to one participant leaving because of medical reasons and two others who decided not to complete the course. This left seven participants in the control group and eight in the experimental one.

Table 1

Quasi-Experimental Research Design

	Control Group N=7	Experimental Group N=8
Required lab preparation	Yes	Yes
Mini lecture	Yes	Yes
Half-day Lab Session	Yes	Yes
Performance Checklist Displayed during lab session (Appendix G)	Yes	No
Case Scenarios (Appendix 9)	No	Yes
Peer-to-Peer Collaboration	No	Yes
Teacher Led Collaboration	Yes	No
Post Lab Quizzes (total =3) (Appendices 3, 4, 5)	Yes	Yes
Observation of Clinical Performance	Yes	Yes

3. Instruments for Collecting Data

A demographic survey (Appendix B) was administered once students had agreed to participate in the study to collect demographic data and establish prior knowledge. Interestingly, those students who had responded negatively to the request to be involved in the study submitted a completed demographic survey. As mentioned previously, students who registered for this course were primarily female, and ranged

in age from adolescent (mid to late) to middle age. The average age for the control group was 17 years of age and for the experimental group was 25.1 years of age. Additionally, a number of students registered in the nursing program had recently immigrated to Canada and their first language was neither English nor French; therefore, comprehension of subject matter has been a problem that has been noted by several faculty members. As these variables have been highlighted by nursing faculty, having demographic data may yield some useful information regarding the need for curriculum changes that can be applied in developing pedagogical strategies.

The quantitative aspect of this study was achieved in the measurement of knowledge and retention of knowledge. These were measured using achievement tests (Appendices C, D, and E) administered at various times throughout the semester. These tests were administered to all students registered in the nursing course to test immediate, mid-term and long term recall of theoretical knowledge. These tests were composed of questions from a bank of questions developed by nursing teachers on the first year team. These questions were not standardized nor had they been tested for validity or reliability. However, they have been used for several years and the results have been consistent; therefore, the content has been deemed valid by these teachers. As the post-lab (formative) quiz evaluated recall of knowledge from the two topics, "Isolation, Asepsis, and Hand Washing" and "Vital Signs and Pain Scales", covered during the lab session and all subsequent lab tests evaluated the recall of knowledge from all six labs, the scores of the questions associated with the Asepsis and Isolation (Infection Control) Lab were used to measure the retention of this particular knowledge.

Ability to use/apply knowledge was directly observed by the clinical teacher in a recorded student performance and during the seven week clinical experience and measured using a performance checklist (Appendices E and F). These observations were the qualitative methods used within this study. The recorded student performance is routinely done at the end of the scheduled lab sessions to assess the

students' ability to perform the skills demonstrated and practiced during the lab sessions. The completed performance checklist is used to measure this ability and is completed by both the student and teacher. As mentioned previously, students in a nursing program are assessed separately for two components: the theoretical component and the clinical component. To be evaluated clinically, students' thinking, actions, and behaviours are regularly supervised, observed, and determined by their assigned clinical teacher and at times their co-assigned registered nurse, during the clinical experience. Therefore, having their performance of isolation precautions and techniques observed is routinely part of the clinical experience. However, formalizing the teacher's observations of students' performance of the isolation precautions and techniques by completing the performance checklist provided concrete data for this research study. The performance checklist developed for the lab was used to observe and code the behaviour. This checklist was based on the principles of infection control and followed the sequence described in the assigned textbook; therefore, were standardized and valid.

The completed checklist was used to code students' behaviour. The number of steps that had to be completed depended upon the type of isolation precautions necessary for each situation encountered by participants. If the situation called for universal, airborne or droplet isolation, then a total of five steps were required. If contact isolation was in place, then twelve steps were necessary. If there was a case that necessitated a combination of isolation techniques, such as airborne and contact isolation, a total of thirteen steps had to be performed. Therefore, each step completed was given a value of 1. These values were tallied and the percentage calculated. The average of the performance percentages for each week was determined and used as the final data for each group.

Another component of the observations and checklist was the recognition and retention of knowledge. This was measured in two ways: (1) self-evaluation and; (2) tracking the frequency of prompting required. With respect to self-evaluation,

students were given a Performance Self-Evaluation Checklist (Appendix F) to complete when viewing their Recorded Performance. These were then submitted to their clinical teachers. Regarding the frequency of prompters, participants were observed for the type of corrective prompting needed to complete the appropriate isolation behaviour. These prompters were labelled as self-corrective, where the participant was able to identify any errors in their technique and correct it autonomously; guiding, where the instructor steered the participant to identifying their error and/or correcting their technique through questions and/or modelling; and directive, where the instructor told the participant what to do.

4. Procedure for Collecting Data

The Dawson nursing program is a six-semester technical program and every semester runs for a total of fifteen weeks. Each nursing course consists of three components: (1) classroom theory, (2) laboratory, and (3) clinical experience. During the first semester of the nursing program, students' schedules consists of four hours of classroom theory per week, one day of laboratory (lab) experience for the first seven weeks of the semester and one day of clinical experience for the last eight weeks of the semester. Students must attend the lab and clinical day that they are registered for.

The quasi-experiment, or intervention, took place on the first scheduled lab day (Figure 1). This lab was divided between two topics that of "Isolation, Asepsis, and Hand Washing" and "Vital Signs and Pain Scales". The time allotted for each of these topics was approximately two hours. These topics were covered either in the morning or afternoon sessions. All students were required to purchase the course lab workbook and to complete the same preparation prior to the scheduled lab session. Also, all received the same teacher-led pre-lab mini lecture of approximately fifteen minutes after having been welcomed to the course, introduced to the lab

demonstrators and been informed of the policies for the lab areas. The students were then divided into their assigned clinical groups.

The student groups and clinical teachers went to their assigned rooms. The initial time was spent getting acquainted using "ice-breakers". Once this had been completed, both the control and experimental groups were brought together into one room, the teachers left the room and the recruiter (a third-party who was not involved in the research) informed the students about the research project emphasizing that their participation was entirely voluntary and it would not affect their grades or their clinical evaluation as their teacher would not be aware of the identity of participants until all marks and evaluations had been completed and submitted. They were also informed that although they must remain in their assigned clinical groups, they were able to refuse to have their data included in the study. Once they had agreed, students were given a consent form to sign (Appendix A) and a demographic survey (Appendix B) to complete. All were instructed to seal the completed forms in the provided, addressed envelope and submit these to the researcher's mailbox. Students over the age of 18 were given time to complete the survey and consent form in class. For students under the age of 18, the consent form was sent home with them to be signed by a parent/guardian. The demographic survey accompanied the consent form. Once consent had been authorized by the parent/guardian (consent form signed), the student was to complete the survey and submit both the consent and the demographic survey in a sealed envelope. Once collected by the researcher from the mailbox, the envelopes were then given to a clerical staff from a discipline other than Medical Technologies and were kept in a locked filing cabinet. All envelopes remained sealed until approximately one month following the submission of all evaluations (both academic and clinical) and final grades.

When the official lab session started, the students assigned to the control group discussed the different types of isolation techniques and when they would be used. The different isolation cards were displayed and their significance discussed.

The sequence of performing isolation precautions (both entering and exiting a room) were practiced as a group. (Note: As the control group consisted of participants from both the Tuesday and Wednesday clinical groups of one clinical teacher, originally the discussion and practice were to be led by the same clinical teacher. However, due to unforeseen circumstances, this was not possible. Therefore, two new confederates were enlisted to direct this lab on the two separate days. That was not the original plan, but given the fact that the new confederates had previously taught this level as well substituted for this level on occasion, the researcher felt confident in the new arrangement.)

On the day prior to the first lab (Tuesday), both confederates were simultaneously instructed to review and demonstrate the various medical asepsis techniques with the students and then allow them to practice using the performance checklist found in the lab manual. If they were asked to provide a rationale for the technique, they were to refer the students to their textbooks; however, if a student or students verbalized the appropriate rationale for a technique, they were to acknowledge it. Hence, their teaching strategy was to maintain the traditional approach.

Those students assigned to the experimental clinical teacher had the modes of infection transmission displayed on the blackboard. These were briefly reviewed and the students were then divided into working pairs. Each pair was given a set of five scenarios (Appendix H) and a bin that contained the isolation equipment needed for all the possible isolation precautions and techniques discussed. Students were instructed to read and discuss each scenario, decide/agree upon the appropriate method as well as the sequence of isolation precautions required to enter and leave the room and then perform it. The teacher circulated between groups to provide feedback, encouragement, support and clarification when necessary. The purpose of the pairs was to involve students in the activity, encourage discussion of the concepts and make the concepts relevant to the students by connecting them to situations that

they would encounter in a clinical situation. The teacher was present to guide students' construction and actions/performance of the knowledge pertaining to medical asepsis and isolation precautions.

At the end of the lab day, a short answer lab quiz was administered to the students that included questions from both topics. This quiz was a formative assessment to aid in reviewing the new knowledge and wrapping up the lab session and was not graded (the grade was not included in the final academic grade). The decision to administer this formative test is usually left to the teacher's discretion. However, for the purpose of this study, both teachers administered this assessment to all their clinical students. The questions associated with the "Isolation, Asepsis, and Hand Washing" lab were scored for both the control and experimental groups by the researcher. The subsequent post-test was administered by two of the teachers to all registered students at the completion of the six scheduled lab sessions which would coincide with the semester's midterm. This assessment can be considered as both a formative and a summative test as it tested students' recall of the knowledge disseminated during the lab sessions as well as highlight the areas that students' must improve upon. The final post-test was administered during the final exam period at the end of the semester with the Objective Structured Clinical Exam (OSCE). The marks from both midterm and final post-tests were part of the final academic grade. These tests were corrected by the clinical teacher using answer sheets that were provided. The completed and corrected tests were kept in the clinical teachers' locked filing cabinets until the end of the semester. This was the usual practice so that the tests were accessible in the event that a student requested to review their exams.

At the end of the six-week lab period, all students had to complete a Recorded Performance (referred to in-course as a Return Lab Demonstration). This activity which occurred during midterm was the first opportunity for students to demonstrate their ability to perform the skills learned and practiced throughout the lab sessions that included the medical asepsis techniques. It involved each student being recorded

either on videotape or on DVD performing these skills over a thirty minute period. All students had to complete this activity prior to being permitted into the clinical areas. They were randomly assigned to a trio and a scenario was posted on the course's website as well as the bulletin board within the college prior to the scheduled day. Each student alternated between being the nurse, the patient and the cinematographer while enacting the scenario. Once the filming was completed, each student was given a Performance Self-Evaluation Checklist (Appendix F) to critique their performance. They were instructed to fill out the checklist with commentary or explanations while viewing their recorded performance and then submit the checklist along with the recording to their clinical teacher within the deadline indicated. These recordings were then viewed and evaluated by the teachers using the same checklist. Once these were done, the teachers met with students individually to discuss their performance and the areas that required improvement. The original checklists were returned to students and a copy of the section of the checklist associated with this study was kept in the locked filing cabinet of the researcher.

An external variable that had not been taken into account originally was the Pandemic Training. During the spring of 2009, the Influenza A (H1N1 flu) virus also known as the swine flu was being found in some of the North American population as well as worldwide. That summer the World Health Organization (WHO) pronounced that H1N1 was a pandemic virus as people had little to no natural immunity to this new virus and therefore it could result in extensive and severe illness (Public Health Agency of Canada, 2009). Because of this, in preparation for the possible pandemic, in mid-fall 2009, the offices of the Ministry of Education and Ministry of Health and Social Services required that all teachers and students who would be practicing in clinical/hospital areas complete and provide proof of having done the Pandemic Training course before entering their assigned areas. This was an online course developed by Health and Social Services Quebec and was estimated to take three to six hours to finish. It consisted of eight modules that included a module entitled, "Prevention of infections (medical and paramedical)", and at the end of each module

there was a "What I Retained" quiz. This module examined the chain of infection transmission, routine precautions and additional precautions, and general prevention measures; all the concepts and skills covered in the Isolation, Medical Asepsis and Hand Washing Lab. All first year nursing students were scheduled to do this online course during the ninth week of the semester prior to starting in their clinical area. Each student was to complete the "What I Retained" quiz of each module, print, sign and then submit these pages to the department chair as proof of having done the course. In having done these modules, the relevancy and importance the concepts and techniques of medical asepsis were reinforced for all students; therefore, both participants of the control and experimental groups benefitted from a review of the concepts and techniques prior to the start of their clinical experience. However, this review did not have any apparent impact on this study's results.

During their eight week clinical experience, the participants were observed for their ability to perform isolation techniques in their assigned clinical areas. As it was not possible to film each student during their clinical experience due to patient confidentiality nor was it possible for the researcher to observe each participating group, the clinical teacher was the observer. Each week, the clinical teacher completed a performance checklist on students based upon her observations. As the ability to apply universal precautions and follow the protocols for isolation precautions were criteria of the course's clinical evaluation tool, these were not new criteria added to a student's evaluation; however, completing the performance checklist was additional pieces of data. The completed checklists were also kept in the clinical teachers' locked filing cabinet.

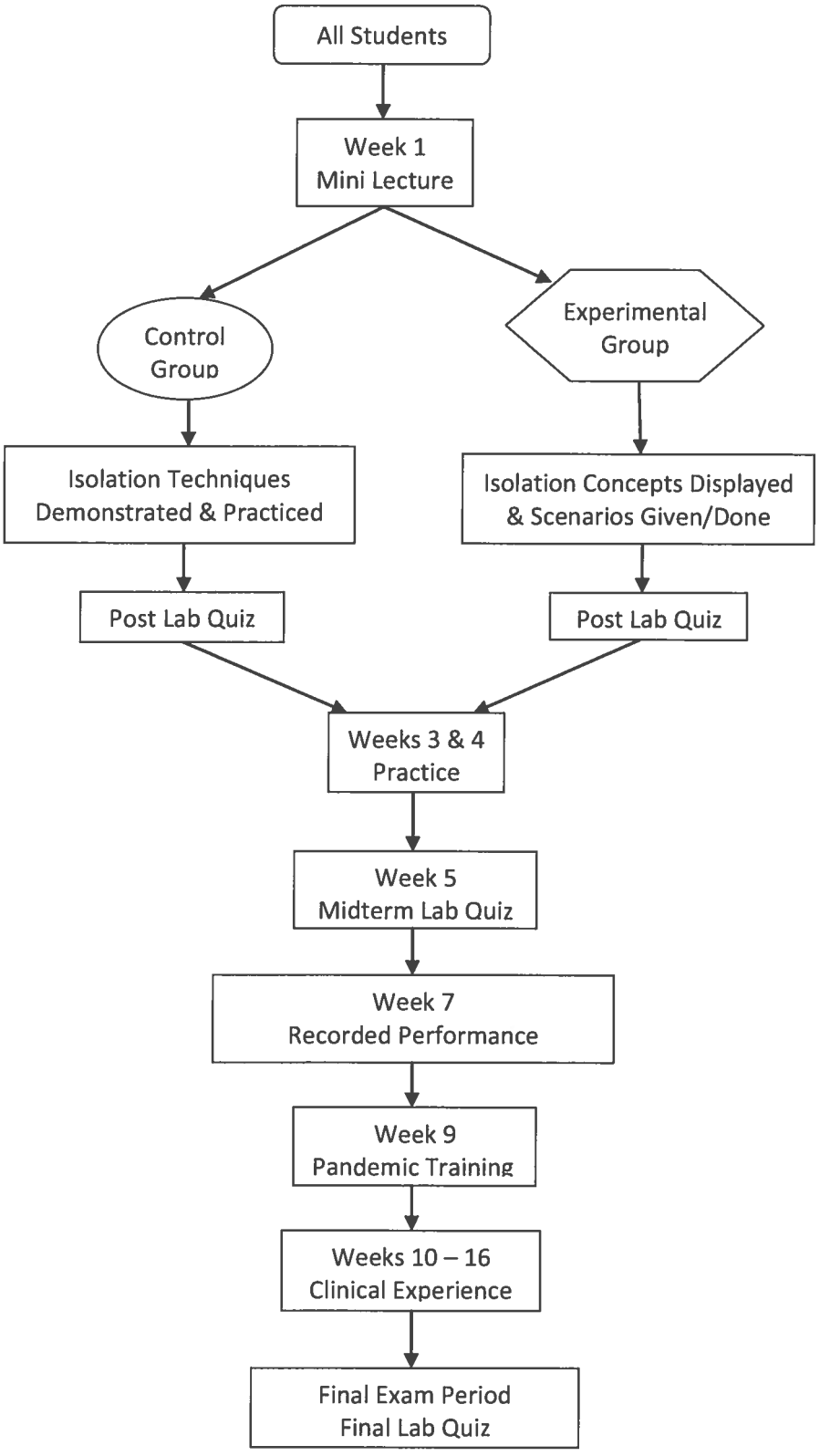

Figure 1. Sequence of Research

CHAPTER FIVE: RESULTS AND DISCUSSION

This study compared the retention and application of a concept, in this case medical asepsis, between two groups of nursing students taught using two different teaching approaches. Both approaches included a self-evaluation component within one of the data collection instruments.

Concept retention was assessed by the grades obtained for questions associated to the concept on three different lab quizzes administered throughout a sixteen-week semester. Thus, a comparison of the academic grades was done between the groups. (Refer to Table 2)

Table 2

Comparison of Academic Marks

	Control (Mean %)	**Experimental (Mean %)**
Formative Lab Quiz	76.3 ± 21.2	51.2 ± 15.8
Lowest Score	40.0	25.0
Highest Score	100.0	85.0
Midterm Lab Quiz	85.2 ± 10.8	74.5 ± 19.7
Lowest Score	70.8	37.5
Highest Score	100.0	100.0
Final Lab Quiz	55.5 ± 32.4	61.1 ± 18.4
Lowest Score	33.3	33.3
Highest Score	100.0	100.0

The Formative Lab Quiz was given at the end of the first scheduled lab day; therefore, during the first week of the semester. The highest score possible on the Formative Lab Quiz was five. The mean percent score for the control group was

76.3%. For the experimental group, the mean percent score was 51.2%. The difference in these marks could be credited to several factors. First, the average age for the control group was 17 years as compared to 25.1 years of the experimental group. Therefore, the control participants had come directly from high school and still retained study habit skills and experience. Whereas, the older participants of the experimental group had not been within the educational system for a period of time and thus, needed to develop or re-develop these skills. Secondly, the lab, along with the quiz, took place during the second and third day of the semester. Many of the participants in the experimental group were not prepared for the lab as some had not bought the course and lab workbook or the required textbooks and most had not done the required readings and/or completed the required study guide before attending the lab. This may be due to financial circumstances, not reviewing the lab manual prior to the lab day and/or not expecting to have required preparatory work for the first day. In comparison, many of the control group had prepared for the lab by completing the required readings and the study guide prior to their scheduled lab day. Finally, due to the curriculum reforms that had been taking place within the Quebec educational system, the control participants had possibly been exposed to and written a few short-answer question exams. In contrast, these types of questions were not used during the educational experience of most of the experimental group; therefore, the control group had prior experience and were possibly better prepared for the Formative Post-Test.

The Midterm Lab Quiz was given during the fifth week of the semester. For this quiz, the highest score possible was six. The control group's mean percent score was 85.2%. The experimental group attained a mean percent score of 74.5%. Both groups' scores showed an improvement. However, a significant improvement was noted in the overall score of the experimental group even though the control group still obtained a higher score. The improvement for both could be attributed to experience, practice, and study skills. This quiz was administered in the fifth week of

the semester. At this time, participants had been given formative quizzes after each lab that provided practice and experience on how to respond to short-answer exam questions. Also, by this time, both groups had had practice time during lab sessions to review the performance of isolation techniques. Finally, as this was a formal exam that would be a part of their final academic mark, participants most probably took the time to prepare for this quiz by reviewing/studying their lab workbook, required readings, and notes.

The Summative Lab Quiz was held during the first week of the exam period which was approximately one week after the last day of classes of the sixteen week semester. The Summative Lab Quiz had a highest possible score of three. The control group obtained a mean percent score of 55.5%. The experimental group accomplished a mean percent score of 61.1%. Therefore, by the end of the semester, the experimental group achieved a higher score than the control group. This change in performance could be attributed to knowledge retention, experience and practice. At the time of the quiz, all participants had finished the labs and the seven-week clinical experience where they had been able to practice isolation precautions in real-life situations. Though both groups had opportunities to apply aseptic concepts and techniques in various yet true situations during their clinical experience, the experimental group also had to attempt to apply these same concepts and techniques to five isolation scenarios during their lab experience. Hence, the knowledge, which may have been abstract initially, became more relevant and understandable to the experimental group earlier allowing it (knowledge) to be better retained.

Application of a concept was determined through observing and evaluating/critiquing the recorded performance of the technique of students. The students were instructed to view and assess their recorded performance. The recording along with their self-assessment was submitted for assessment by their

assigned clinical teacher. The Midterm Self-Evaluation Performance Checklist (Appendix F) was used by the student and teacher to assess the student's performance of contact isolation when viewing the tape. There were a total of eleven criteria considered by the students and teachers for this assessment. The criteria that were performed were totalled, the mean score was calculated for both the control and experimental groups and the mean scores were used for comparison. (Refer to Table 3)

Table 3
Comparison of Recorded Performance Assessments

	Control (Mean)	**Experimental (Mean)**
Student Evaluation	81.8% ± 15.8	90.9% ± 6.4
Lowest Score	45.5	81.8
Highest Score	100.0	100.0
Teacher Evaluation	69.3% ± 15.0	73.7% ± 14.4
Lowest Score	36.4	54.6
Highest Score	90.9	90.9
Identified Errors by Student	2.0 ± 1.6	1.0 ± 0.7
Unidentified Errors by Student	1.3 ± 0.7	2.1 ± 1.6

The participants in the control group self-scored a mean percent of 81.8% for their execution of isolation technique. The teacher's mean scoring of this group was 69.3%. On average, students were able to identify errors in their performance 2 times, but were unable to discern additional errors 1.25 times. Students of the experimental group self-scored a mean percent of 90.9%. The teacher's mean assessment of this group was 73.7%. Thus, the students in the experimental group scored themselves higher than the control group, and more significantly, so did the teachers. Within this group, students were able to recognize performance errors 1 time, but were unable to identify other errors 2.1 times. An issue that may have affected the result was the fact that this was the first occasion for all students to self-evaluate their performance in a

written and formal manner within the nursing course as well as within the program. Although this instrument could have yielded noteworthy results, it is difficult to state the significance of these results with regards to this study for the following reasons. First, the media format used for recording the performance was not uniform. Some students recorded on videotape while others did so on DVD. This was due to the availability of equipment; there were two DVD set-ups and four videotape set-ups available to record all the registered students over a two-day period. Therefore, the viewing quality of the final product was not equal for everyone. Second, the camera work of the end product was not standardized. Participants were filmed by peers and instructions regarding how to film were given by various faculty members. This may have resulted in differences in directives given to participants and other students. Also, variances in the actual filming were noted. Some recordings remained static, meaning the camera view remained unchanged throughout the performance; there was no zooming in or out, or changing the camera position to better record the actual skill. Thus, some behaviours were not caught on tape that led to difficulty in validly reporting whether or not a criterion had been performed. At the other end of the spectrum, some recordings zoomed in or out when necessary and changed positions for the best angle possible, thereby focussing on the activities of note. Finally, the environment where the participants viewed their recorded performance was not controlled. Once the recording session was finished, the participants (as well as all students) were given the checklist, instructed to view their performance and complete the checklist. No guidelines were given to the participants as to where or when the recorded performance had to be viewed, only when the completed performance checklist had to be submitted. Therefore, some may have viewed their performance immediately by using the equipment available in the college's library and others may have postponed the viewing until later in the day or evening so as to be able to watch it in their home or elsewhere. In other words, there was no way to ensure the type of the participants' viewing. There may have been a range in the way each participant viewed their performance from not actually viewing the recording (relying on memory of the experience) to watching their performance vigilantly.

Application of a concept was also ascertained through the observation and evaluation of students' performance of the techniques during their clinical experience. The Performance Checklist (Appendix G) that was similar to the Midterm Self-Evaluation Performance Checklist was used by the clinical teachers to assess each student's performance. This checklist had a total of fifteen assessment criteria and depending upon the type of isolation and intervention required for a situation, a student was assessed on a minimum of three (universal precautions) to a maximum fifteen (combination of airborne/droplet and contact precautions) criteria. As with the recorded performance, the performed criteria were added, the mean score calculated for both the clinical and experimental groups and then theses values were used for comparison. (Refer to Table 4)

Table 4
Comparison of Observations of Clinical Performance

	Control (Mean)	**Experimental (Mean)**
Week 12		
Performance	100% ± 0.0	100% ± 0.0
Prompters Used		
Self-corrects	1.4	2.0
Guiding	1.4	0.0
Directive	0.7	0.0
Week 13		
Performance	100% ± 0.0	97.5% ± 6.6
Prompters Used		
Self-corrects	1.5	1.9
Guiding	1.0	0.3
Directive	0.5	0.0
Week 15		
Performance	95.0% ± 0.0	97.5% ± 6.6
Prompters Used		
Self-corrects	1.3	2.0
Guiding	1.0	0.1
Directive	0.0	0.0
Week 16		
Performance	100% ± 0.0	96.5% ± 6.8

Prompters Used		
Self-corrects	1.7	1.8
Guiding	1.3	0.3
Directive	0.0	0.0

During the seven-week clinical period which covered weeks 10 to 16 of the program, the control group's lowest mean percent performance score was 95.0% and its highest score was 100.0%. For the same time period, the lowest mean percent of the experimental group's performance was 96.5% and its highest score was 100.0%. Thus, there was no significant difference in the ability to perform isolation techniques between the two participating groups.

Transfer of knowledge was ascertained through observation of the type and frequency of prompting. (Refer to Table 4) The types of prompting observed were *self-correcting, guiding and directive. Self-correcting* prompting was defined as the student recognizing his/her own error and correcting it without external assistance. During the seven week clinical experience, the highest frequency of this prompter was 1.7 for the control group. The highest was 2.0 for the experimental group for the same time period. These scores would seem to imply that the experimental group was more capable at applying the techniques autonomously. Prompting by *guiding* was taken to mean that through questioning, the student was led to identify an error and thus modify his/her actions appropriately. On average, the control group required guiding prompts 1.4 times, whereas the experimental group required guiding prompts 0.3 times. The final prompter of *directive* was defined as the student being instructed by the clinical teacher as to the appropriate precautions or actions required for the situation. Overall, the control group required directive prompts 0.7 times, whereas no students in the experimental group required directive prompts. The frequency that the guiding and directive prompters were given to the control group revealed that the control group required more external help to perform the technique as compared to the experimental group.

CHAPTER SIX: ANALYSIS AND CONCLUSION

1. Analysis

Initially, there were a total of 18 participants enrolled in the study with 8 in the control group and 10 in the experimental group. In view of the fact that one of the participants was not able to take part in the clinical component of the course due to medical reasons, her data was not included in this research. Two other participants (one in the control group and one in the experimental group) decided not to complete the course after the twelfth week of the semester (or third week of clinical experience). Their data was included in the final analysis as one observation of performance of isolation precautions was completed. However, no data was available for further performance observations nor was data collected on the Summative Lab Quiz for these participants.

1.1. Comparison of Academic Marks

A comparison of the results from the Formative Post-Test (Lab Quiz 1) showed that the control group achieved a higher overall score (76.3% $\pm$ 21.2) than the experimental group (51.2% $\pm$ 15.8). The standard deviations for both groups show that there was a wide dispersion of the test scores from the mean score meaning that the actual test scores were spread over a large range of scores from the mean. What was interesting to note was that the experimental group's dispersion was narrower than the control group; meaning that their scores were closer to the mean of 51.2%, but still much lower than the control's mean score. Hence, the first hypothesis of this

study of PBL students performing at least as well as procedural students on a test of immediate recall of knowledge was not supported.

In the Midterm Post-Test (Lab Quiz 2) the control group attained 85.2% (±10.7) and the experimental group had 74.5% (±19.7). While the standard deviations still demonstrated a wide dispersion from the mean scores for both groups, it should be noted that the control group narrowed their range in scores significantly from the previous achievement test whereas the experimental group showed an insignificant widening. Although the control group still achieved a higher overall score than the experimental group, there was a significant improvement in the mean percent grade obtained by the experimental group. At this time, it would appear that the results obtained for this test did not support the second hypothesis of PBL students performing better on future achievement tests. However, further analysis brought about another conclusion.

Finally, by the end of the term a change was noted with the Summative Post-Test (Lab Quiz 3). With this achievement test, the experimental group's overall mean grade of 61.3% (± 18.4) was higher than the control group's mean grade of 55.5% (±32.4). Both the experimental and the control groups had high standard deviations; thus demonstrating a wide range in their scores from the mean groups' scores. Again, it should be noted that the standard deviation for the experimental group did not show a significant change from the previous achievement tests. However, the dispersion for the control group was at the largest of all three tests which would indicate that there was a large range in their test score values. With the results of the final test, the second hypothesis of this study that PBL students would perform better on future tests of knowledge was supported. It has been hypothesized that in order for knowledge development, comprehension, and retention to occur, it is necessary for students to be responsible for their learning. (Ibarreta & McLeod, 2004; Sewchuk,

2005; Candela, Dalley & Benzel-Lindley, 2006). The experimental group's higher score on the Summative Post-Test seems to support this. In using PBL approach with the experimental group, the students had to identify the concepts needed and use the available resources to solve the problem set out for them. This promoted active involvement in their learning and peer collaboration as they worked in pairs and placed the teacher in the role of facilitator and model. Ultimately, the participants and teacher were responsible for their (participants) learning. Beane (1997) and Phaneuf (2006) argued that students connect prior knowledge and new knowledge when they are able to use theoretical knowledge within a context that is real to them; thus making the theory relevant to them and increasing the probability of retaining the knowledge. Again, the Summative Post-Test result of the experimental group seems to suggest that this idea, which is consistent with the principles of the PBL approach, is responsible for better long-term knowledge retention than the control group. This post-test was administered during the final exam period of the fall 2009 semester; therefore, at the completion of the sixteen-week course. By this time, all participants had finished the labs and the seven-week clinical experience where they were able to practice isolation precautions in real-life situations. This allowed the knowledge which may have initially been abstract to them to become more concrete, relevant and therefore more comprehensible to the students.

1.2. Comparison of Recorded Performance

The participants' performance of isolation precautions was first observed during the recorded performance (entitled Return Demonstration within the course) that took place during the seventh week of the semester. The purpose of this activity was for the student to display his/her ability to perform the skills shown and practiced in labs which included isolation techniques while being recorded by another student (see Chapter 4, section 3 for a full explanation). Once the recording was complete, the student/participant viewed and evaluated his or her performance of the skills using

the checklist provided by faculty (Appendix F). This was then submitted to the teacher who also assessed the performance using the same criteria. From Table 3, it can be seen that the self-evaluation and the teacher's evaluation were higher for the experimental group than for the control group. However, control participants were better able to identify/report errors in their performance than experimental participants. This was also evident with the reported unrecognized errors noted by the teacher's evaluation where again the experimental group obtained a higher "grade" than the control group. In the previous chapter it was noted that it was difficult to state the significance of the results obtained from this instrument due to the following three reasons: (1) the media format used to record the performances was not uniform; (2) the camera work of the recorded performance was not standardized; and (3) the environment where the student viewing took place was not controlled. These points and their possible impact on the results were discussed in more detail in Chapter Five. Consequently, there was no consistency in how all the participants completed this part of the study and thus no valid connotation can be drawn from these results.

1.3. Comparison of Clinical Performance

During the seven-week period within the hospital, the performance of isolation techniques by the participants was observed and assessed by the teachers of the different groups according to the Performance Checklist (Appendix G). When looking at only the ability to perform the appropriate technique correctly, the control group was comparable to the experimental group throughout the clinical experience. The mean percentages of both groups were either equal or minor differences were detected (difference between percentages $\leq$ 3.5%). Two conclusions can be drawn from this. First, this result does suggest that with frequent practice of a skill, an individual will consistently perform it appropriately. This appears to demonstrate what had been proposed by Hom (2003) and O'Neill, Dluhy and Chin (2004) that as an individual is exposed to more situations that are similar, he or she starts to accumulate more memory patterns to refer to in order to guide his or her actions. As

well, it shows that when individuals are provided with practice time, their competence and confidence in their ability to perform the skill increases. Secondly, it can be said that the approach to teaching a skill (traditional or problem-based) has no significant effect on the *ability* to perform the task being taught. Although this showed that practice has an impact on the ability to perform a task, it did not demonstrate that the knowledge of when to use the skill has been integrated into their knowledge base.

1.4. Comparison of Prompters

Alongside the performance of isolation techniques, participants were also observed for the type of corrective prompters that were required for the appropriate technique to be utilized during the clinical experience. As mentioned earlier, these prompters were labelled as *self-correcting, guiding and directive.* Throughout the seven-week period, the experimental group consistently scored higher than the control group in their use of self-correcting. Interestingly, the higher scoring of self-correcting prompters by the experimental group would indicate that these participants were better able to apply their knowledge than the control group. In having been actively involved in and responsible for their learning during the lab, when placed in relevant and real-life situations where the concepts were required for action these participants were better able to recall and apply their knowledge. This higher score also seems to imply that the experimental group had comprehended and integrated the concepts of medical asepsis. As peer collaboration and group collaboration were components of the PBL approach used in teaching the concept of medical asepsis, the experimental participants discussed their ideas which meant that they had to organize and clearly express their thoughts. Thus, students processed and integrated new information from which a new understanding was constructed.

During the same time period, it was noted that the experimental group did not require as many guiding or directive prompts. Their rates were minimal for the use of both guiding and directive prompters. While the mean rates for the use of guiding and directive prompters were low for the control group, they were significantly higher when compared to those of the experimental group. Previously, it was stated that both groups performed the actual technique appropriately. However, these results demonstrate that the control group required more external assistance to be able to accomplish this. These results also hint at the possibility that the experimental participants have transferred their knowledge at an earlier rate than the control group.

1.5. Summary

One of the problems that had been remarked upon by different nursing faculty over the years is that nursing students have difficulty recognizing the various situations where a concept should be applied or adapted. During the clinical experience, students/participants are exposed to a variety of situations where the concepts of medical asepsis are required. These situations are not always the same as the learning scenarios used within the medical asepsis lab, but require the use of the same concepts and isolation techniques. Thus, student-participants have to identify the problem and recognize what concept is required prior to deciding upon the correct action to take in new situations. In this study the experimental students were able to recall and apply this knowledge demonstrating that the theory was understood allowing them to adapt it to a variety of situations. In other words, this constructed knowledge was now flexible and transferable. Also, with each new situation, the necessity for and the relevancy of the concept was brought to light, thereby broadening and consolidating the construction and integration of the new concept into the student-participants' knowledge base. This resulted in a higher tendency for the experimental group to perform the isolation technique autonomously. As these students were able to perform the techniques autonomously, this demonstrates that they have started to connect the concepts to their actions or transferred this

knowledge to their practice and should lead to the probability of their applying these concepts appropriately and more consistently in their future practice. Therefore, the third hypothesis of this study may be seen as being partially supported by these results.

2. Anecdotal Note

Both the control group and experimental group included a participant who either had been or was employed during the research period within a healthcare institution in some capacity. Both individuals obtained a passing or higher grade in all three achievement tests. Additionally, during their clinical experience, they were observed performing the correct isolation technique appropriately and autonomously. In other words, only self-correcting prompters were observed being used by them. They did not require guiding or directive prompters. This would suggest that students with the prior experience of working in establishments where these techniques would have either been used or observed were able to perceive the relevancy of the concept of medical asepsis and to relate this concept to their practice earlier than those students who did not have this past experience. As a result, this probably eased the integration, comprehension and application of the theory into their knowledge base. This may have implications for admission requirements of future students into a nursing programme. To facilitate the success within a nursing programme, should one of the pre-requisites be prior employment within a healthcare facility? Should nursing programmes actively recruit students from these institutions? These questions should be pondered in the future.

3. Limitations

One of the major limitations of this research study is the number of participants. For this type of study, a minimum of 30 participants in each group is recommended (Gay, Mills & Airasian, 2009). The final sample size was 15 with 7 in the control group and 8 in the experimental one. As this was a single case study combined with a small sample size, it is difficult to be confident about the results obtained. Therefore, it is difficult to make generalisations regarding the use of a PBL strategy with nursing students based on this study. However, these results are promising in as much as they seem to suggest that further study with larger groups or several studies using small groups would be valuable for nursing education.

Another limitation encountered with this study was the fact that the groups were not equivalent. The control group was demographically uniform in that the participants were all female nursing students who were seventeen years old and recently completed high school. Most spoke either English or French at home (only one of these participants spoke a language other than these in the household) and were educated in either of these languages. The experimental group was more multicultural with both female and male students ranging in age from 17 to 45 years (average age of 25), approximately half spoke a language other than English or French in the home and all were educated in either one of the official Canadian languages. Being homogeneous, the control group was not truly representative of the population as the nursing program attracts individuals of different ages, from all corners of the world, and diverse walks of life. Also, for a valid comparison between the groups, the participants should have been equitable or matched demographically as this would help to control for the possibility of these extraneous variables influencing the study's results. As the study used a convenience sample that was formed before the participants were recruited, there was bound to be differences that could not be inhibited. However, if these variables were controlled for, this would

have weakened this study due to the manipulation of group assignment and the decrease of randomization.

An additional limitation is the number of observations made within the control group. Even though weekly observations of isolation techniques for 6 out of the seven week clinical experience (as the first week was orientation) were submitted for all participants of the experimental group, this was not the case for the control group. Weekly observations were only submitted for 4 out of 6 weeks (none for weeks 2 or 5). Therefore, for purposes of comparison, just the data collected in weeks 3, 4, 6 and 7 were analyzed.

4. Conclusion

This study sought to examine the effect of teaching strategies on students' retention, comprehension and application of concepts through the comparison of two clinical groups of first-year nursing students enrolled in a Cegep nursing program. It was hypothesized that (1) students who received knowledge about a specific nursing concept and practice, such as medical asepsis, through a PBL approach would perform at least as well on tests of knowledge recall immediately post intervention than students who learned the same concept and practice by a procedural approach; (2) "PBL" students would perform better on future tests of knowledge recall; and (3) "PBL" students would apply their knowledge better during their clinical experience than the "procedural" students.

As to hypothesis #1, this study unfortunately did not support it as the experimental group obtained a significantly lower result on the first achievement test (Formative Post Lab Quiz) than the control group. The results in relation to hypothesis two were supportive in that although the experimental group did not outperform the control group on the second achievement test (Midterm Post Lab Quiz), there was a marked improvement in their score. As well, the experimental

group did obtain a higher overall score for the final achievement test (Summative Post Lab Quiz) than the control group. With respect to hypothesis three, the findings were two-fold. First, no difference was found between the groups in the actual performance of the technique. This suggests that approaches to teaching a skill have no significant impact on the *ability* to perform a skill, but rather frequent practice of a skill increases an individual's memory of the skill, ability to perform the skill and confidence in his or her ability to perform the skill. Most importantly, the experimental group were better able to *apply* their knowledge as they were able to identify and correct errors in their skill autonomously more often than the control group. In order for an individual to recognize an error in one's actions, the person must be able to recall the appropriate concept/theory and perceive its relevancy to the situation. Additionally, the individual must have an understanding of the concept which means that he or she has integrated it into their knowledge base and constructed a new knowledge base. Finally, the ability to correct one's behaviour demonstrates the ability to apply the new knowledge to a situation fittingly. The ability to evaluate one's own behaviour demonstrates that this process has taken place and learning was achieved. Incidentally, it was found that students with prior working experience within a health care institution consistently passed the achievement tests and performed isolation techniques appropriately and autonomously whether they were in the experimental group or the control group. It would seem this prior experience facilitated a student's integration, comprehension, and application of theory.

As the study's sample size was small, valid generalisations could not be made regarding the use of the PBL approach with nursing students. However, the results highlight the need for further research in this area. As was previously suggested, a similar study conducted with a larger sample would benefit nursing education. This would also increase the probability that the sample would be more demographically heterogeneous and better reflect the population of nursing programs. Another modification to this study would be to conduct a longitudinal study with a

particular cohort over the length of the nursing program. This would examine the longevity of the retention, comprehension and application of the concept by the students. Another aspect that emerged from this study and should be further researched would be to study the impact of prior working experience within a health care institution and the success of a nursing student.

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APPENDIX A

Student Consent Form

STUDENT CONSENT FORM

I, Arlene Hyland, am asking for your help in completing my Master's research project. This project will study the effects of a constructivist approach to teaching on a student's knowledge, retention of knowledge, and ability to use knowledge. This study will not require any extra work upon the student's part. Data including responses to written questionnaires that provide demographic information and prior knowledge, lab test scores and clinical performance results will be collected from students in the class. I am asking your permission to include the data you provide (along with the other students) in my study.

ALL INFORMATION COLLECTED FOR THE PURPOSE OF THIS RESEARCH WILL BE KEPT STRICTLY CONFIDENTIAL. NO NAMES OR ANY OTHER IDENTIFICATION WILL BE USED IN ANY PUBLICATION(S) THAT MAY RESULT FROM THIS STUDY AND NO NAMED DATA WILL BE RELEASED TO ANY DAWSON FACULTY. Please be assured that the researcher will not be informed of your decision and the collected data will not be viewed or analyzed until after all evaluations (both academic and clinical) and final grades have been submitted.

Whether or not you decide to participate in this project, you are obliged to remain with your assigned clinical group and complete the course as described in the course's main workbook. Your participation in this research project is entirely voluntary. You have the right to refuse that your data be included within the study. Your non-participation will in no way affect your standing in this course or program. Please indicate your wish to participate by completing the appropriate section below. If you do not wish to participate, draw a large 'X' through the form

Any questions or concerns that you have with respect to this study should be addressed to Arlene Hyland via email at ahyland@dawsoncollege.qc.ca or via phone message at 514-931-8731 local 1710.

I agree to participate in the research project conducted by Arlene Hyland. I have carefully read the above description and understand the agreement. I freely consent and agree to be part of this study.

Name (please print): _____

Student ID: _____

Student's Signature: _____

(Parent's signature if under the age of 18 years of age)

Date: _____

I would like a copy of the study's findings when they are available: YES ☐ NO ☐

APPENDIX B

Demographic Survey

Demographic Survey

Name: _____

1. Age: _____
2. Gender: Female ☐ Male ☐
3. What language(s) do you speak at home?
   _____
4. What was your principle language of instruction prior to admission into this program?
   _____
5. Have you ever been employed in a healthcare institution?
   YES ☐ (please continue to question #6)
   NO ☐ (please go to question #7)
6. If yes, what is/was your job title?
   _____
7. Prior to this course, have you ever received instruction on infection control?
   YES ☐ (please continue to question #8)
   NO ☐ (please submit survey)
8. Briefly describe what you know about infection control.
   _____
   _____
   _____
   _____
   _____
   _____

Thank you.

APPENDIX C

Lab Quiz 1 (Formative Test)

LAB QUIZ 1 (FORMATIVE POST-TEST)

Please answer the following SHORT ANSWER QUESTIONS.

1. Identify four (4) situations when nurses should wash their hands.

   (a)_____

   (b)_____

   (c)_____

   (d)_____

2. Define the term "nosocomial infection":

   _____

   _____

3. The nurse is wearing a gown, gloves and mask. Which item should be REMOVED FIRST?

   _____

4. Define the term "Tier One Precautions".

   _____

   _____

   Provide one example that illustrates "Tier One Precautions":

   _____

5. Define the term "medical asepsis".

   _____

   _____

APPENDIX D

Lab Quiz 2 (Midterm Post-test)

LAB QUIZ 2 (MIDTERM POST-TEST)

1. Define the term NOSOCOMIAL INFECTION.

   _____

   _____

2. Identify four (4) situations when nurses should wash their hands.

   1. _____
   2. _____
   3. _____
   4. _____

3. Define the term MEDICAL ASEPSIS.

   _____

   _____

4. Define the term TIER ONE PRECAUTIONS.

   _____

   _____

5. Provide two (2) examples that illustrate TIER ONE PRECAUTIONS.

   1. _____
   2. _____

6. Identify two (2) types of isolation precautions which illustrate TIER TWO PRECAUTIONS.

   1. _____

   2. _____

APPENDIX E

Lab Quiz 3 (Summative Post-Test)

LAB QUIZ 3 (SUMMATIVE POST-TEST)

1. Mr. Smoky is diagnosed with a respiratory infection that is spread by droplets. List the personal protective equipment the nurse must wear when entering the client's room to take his vital signs.

   _____

   _____

   _____

2. The nurse has completed her care with Mr. Smokey and is ready to exit the room. List in correct order the two (2) actions that the nurse must perform before removing her mask.

   _____

   _____

   _____

3. You are looking after a client who has been diagnosed with a gastrointestinal infection obtained from drinking contaminated water. In the chain of infection, the **water** is the:

   _____

APPENDIX F

Midterm Performance Self-Evaluation Checklist

MIDTERM PERFORMANCE SELF-EVALUATION CHECKLIST

STUDENT: _____

CHECKLIST FOR ISOLATION TECHNIQUE

Procedure:	Student's Comments:	Teacher's Comments:
Before entering room		
Removes any rings or bracelets and washes hands.		
Puts on gown, tying waist and neck ties and covering entire uniform.		
Puts on disposable gloves, pulling edges over sleeve cuffs of gown.		
In room		
Performs all tasks maintaining isolation technique.		
When leaving room		
Undoes the waist ties.		
Takes off gloves (glove on glove, skin on skin) and discards into garbage.		
Undoes the neck ties.		
Removes gown by pulling from under wrist cuff and slipping hands into the sleeves, pulling the gown off the shoulders and body, touching only the inside.		
Folds the gown with all outside surfaces toward the centre.		
Places gown in the plastic bin or laundry hamper.		
Washes hands.		

APPENDIX G

Performance Checklist

PERFORMANCE CHECKLIST

Student Name: _____ Week: ____

Type of Isolation (check one):

Universal ☐ Contact ☐ Airborne ☐ Droplet ☐

Entering room:

Procedure	Applicable	Done
Remove any rings, watch (if the room does not have a wall clock and watch needed, places watch in a plastic bag or on a piece of towel).		
Washes hands or uses sanitizer		
Puts on mask		
Puts on gown		
Ties waist and neck ties (making sure that all parts of uniform are covered)		
Puts on disposable gloves over cuffs of gown		
Enters room		

Prompters	
Type	Frequency (Check each time observed)
Self Corrects	
Guiding	
Directive	

Exiting Room:

Procedure	Applicable	Done
Undoes waist ties.		
Takes off gloves (glove on glove, skin on skin)		
Removes mask		
Undoes neck ties		
Pulling from under wrist cuff, slips hands out of gown		
Leaning forward, drops gown off shoulders touching the inside only and turns gown inwards		
Folds gown with all outside surfaces toward centre and places it in laundry bin in room		
Washes hands or uses sanitizer outside room		

Prompters	
Type	Frequency (Check each time observed)
Self Corrects	
Guiding	
Directive	

APPENDIX H

Isolation Scenarios

ISOLATION SCENARIOS

Instructions

For each scenario, decide what precautions are necessary in order to complete the task. Once these have been decided upon, implement these precautions to enter and exit the room, and dispose of the used equipment. Please use a separate piece of paper for your notes, do not write on the scenario cards

Scenario 1

Mr. Moore is admitted for hypotension and is presently on bed rest. He has been ringing his call bell as he needs to urinate, but his urinal is full. Your co-assigned nurse has asked you to empty his urinal.

Scenario 2

Mrs. Leigh has been hospitalized for a stroke and is your assigned patient today. She requires assistance with feeding and hygiene as she is partially paralyzed. The ward was recently informed of a positive MRSA result from a swab taken from Mrs. Leigh's nare. Her meal tray has arrived and you must help her eat.

Scenario 3

Ms. Kalman is a volunteer who has recently returned to Canada after a two-year assignment with the Red Cross in Rwanda. She has been admitted with a diagnosis of suspected tuberculosis. As the nurses are busy on the ward, you have been asked by one of them to take her T, P and RR.

Scenario 4

Mr. Cole is admitted with frequent coughing and sneezing. He has been diagnosed with influenza. He has been fatigued and has been unable to tolerate any activity beyond sitting up in bed. You are to change his bed linen.

Scenario 5

Mrs. Prescott has been diagnosed with pneumonia and respiratory syncytial virus (RSV). She requires assistance with hygiene, feeding and ambulation. Your task is to give Mrs. Prescott a bed bath.